International Journal of Engineering and Technology(UAE), 2018, vol.7, N4.7 Special Issue 7, pages 241-244

Assessment of technical condition of polyurethane foam thermal insulation pipelines of heating networks using neural network technologies

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Abstract

© 2016 Authors. Pipelines of heat networks are an important element of heat supply to cities and industrial facilities. To increase the reliability of the operation of pipelines of heating networks, reducing the number of their accidents and increasing the economic parameters of transportation of heat energy, it is required to constantly increase the volumes and quality of complex diagnostics. The instruments currently used for the diagnosis of pipelines have many shortcomings. Among them, low reliability of detection of defects and subjectivity of decisionmaking, as well as lack of funds for diagnostics of preinsulated pipelines (in polyurethane foam insulation). To simplify, accelerate and improve the reliability of monitoring the technical condition of pipelines, the authors set the goal of diagnosing the object of research using acoustic methods, using neural network technologies to process acoustic signals. The article describes experimental studies of pipelines of heating networks in polyurethane foam insulation with various sizes of defects and an analysis of the acoustic signals obtained at the same time is made. The frequency of natural oscillations of the pipeline is chosen as the determining parameter of the acoustic signal. To process and analyze the frequencies obtained as a result of the experiments, a neural network of back propagation of the error was constructed. The results of the classification of the neural network of back propagation of the error trained by the neural network showed its good ability to analyze unknown samples and a high degree of reliability of their recognition.

Keywords

Acoustic signal, Corrosion, Defect, Diagnostics, Finite element model, Heat networks, Neural network, Pipelines

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